1954

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INTRODUCTION

Aspen is a short-lived tree widely distributed on this continent. It is characterized in early life by vigorous root suckering, resulting in dense pure stands of from 3000 to 11000 stems per acre. At age 20 to 30 years, excessive competition between plants greatly reduces this number and the aspen gradually die and are replaced by other species till by age 60 to 70 years most of the aspen has passed out of the stand. It is considered a pioneer tree species in plant succession, invading abandoned fields or forest areas which have been denuded by cutting and fire, and spreads rapidly by root suckering. It is because of this root suckering habit that it is extremely hard to control by chemical sprays during it's youth.

BASAL SPRAY TESTS IN THE DORMANT SEASON, 1950-52

In 1950 it was decided to attempt aspen control through a series of consecutive dormant basal sprays. The area chosen for these tests had been burned several times in the past 15 years, the last fire being in 1946. It was covered with a dense stand of aspen of which 95 to 100% were under 2 inches in basal diameter and 10 to 15 feet tall. White and red pine had been planted immediately after the fire and these were severely suppressed by the aspen. The dormant season was selected as being the time when injury to planted conifers was least apt to occur.

The progress of these dormant treatments was reported in 1952(2). Some of these plots have now been treated three times. The four year results shown in Table 1 and in Figure 1 are intended to supplement the original report and as a background for spray tests made at various seasons of the year. All sprays were applied to the basal 12 inches of the stems.

TABLE 1

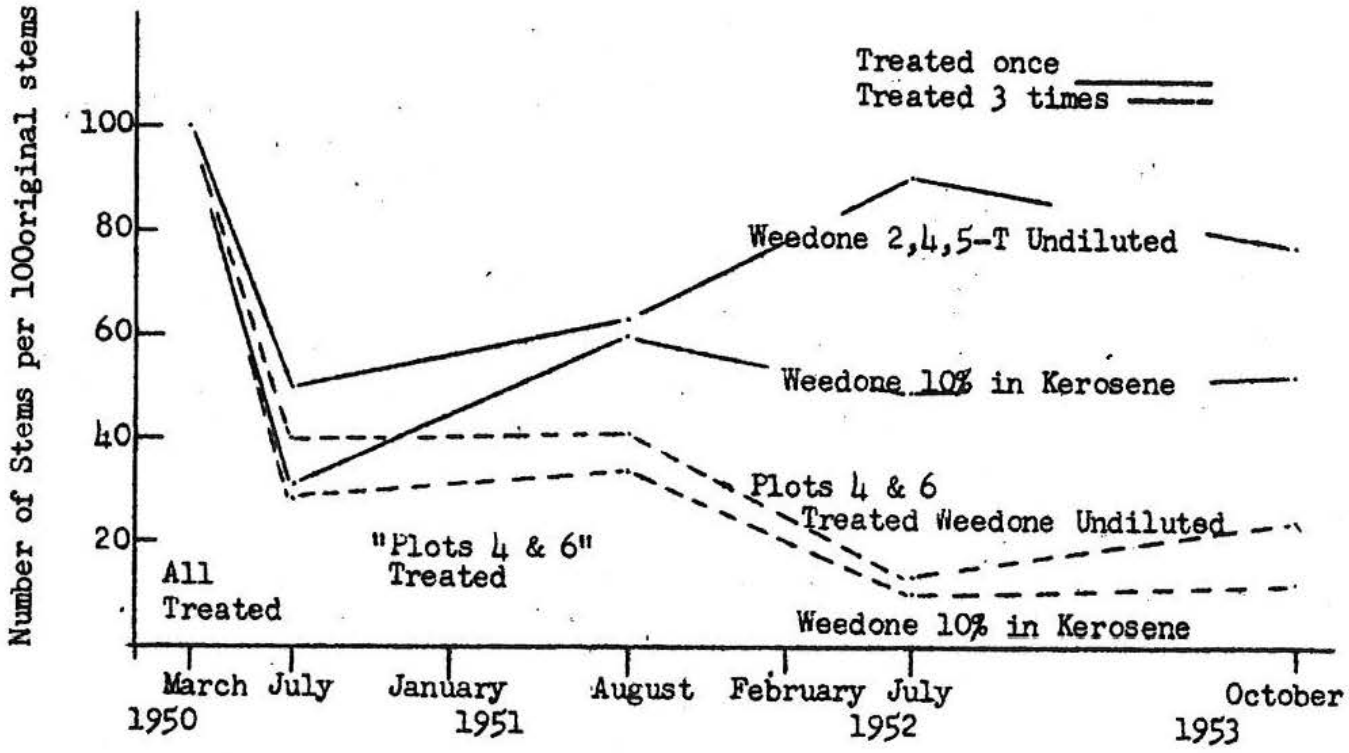
Effect of 2,4,5-T Dormant Basal Spray on Aspen. The Formulation Used Contained 4 lbs. of Acid Per Gallon

Plot No.	Type of Basal Application	Original Tally* March'50	Date Treated	First Retally July'50	Date Treated	Second Retally Aug.'51	Date Treated	Third Retally July'52	Fourth Retally Oct.'53
1	Weedone 2,4,5-T	312	March	155	None	198	None	284	239
6	Undiluted	1104	1950	307	Jan.'51	458	Feb.'52	153	268
3	10% Weedone 2,4,5-T in	680	March	639	None	598	Original Stems not		
5	Water	503	1950	416	Jan.'51	431	killed - Discontinued		
2	10% Weedone 2,4,5-T in	783	March	241	None	467	None	386	422
4	Kerosene	393	1950	155	Jan'51	133	Feb.'52	37	48

* "Tally for 0.1 Acre plot."

FIGURE 1

Effect of Dormant Basal Treatments on Aspen



As shown in Table 1 none of the dormant treatments were successful in eradicating aspen. Certain conclusions can be drawn from the data however:

1. Winter is not the season to basal spray young aspen for complete eradication.
2. In basal treatments the sprayed solution (10% Weedone 2,4,5-T in kerosene on plots 2 and 4) is consistently superior to pure Weedone 2,4,5-T (plots 1 and 6) painted on the basal stems.
3. Repeated treatments (plot 4) are necessary to effect a reasonable control.
4. The retreatment in the second winter does not seem effective probably because many root suckers do not appear till the second growing season.

SEASONAL BASAL SPRAY TESTS, 1952-53

The area chosen for these tests was adjacent to the dormant spray test area and had a similar fire history. The purpose in treating was to release white pine, planted in 1946, a practical problem often encountered in Christmas tree production and in other situations where conifers are in competition with aspen.

Six plots were laid out in March of 1952 and another added in July of 1953 so as to fall in different seasons identified by various phenological characteristics as follows:

Season	Months	Phenological Characteristic	Date of Application
Spring	April-May	Beginning of growth	May 10, 1952
Early Summer	June-July	Active growth	June 16, 1952 July 31, 1953
Late Summer	August-Sept.	Growth terminating	Sept. 8, 1952
Fall	Oct-Nov.	Beginning of Dormancy	Oct. 31, 1952
Early Winter	Dec.-Jan.	Dormancy	Jan. 1, 1953
Late Winter	Feb.-March	Beginning of Activity	March 30, 1952

The July 31, 1953 plot was added as an additional comparison with results obtained by Arend (1), who worked with larger aspen and reported no sprouting after spraying during the period of full leaf development.

The basal spray technique used consisted of spraying the bottom 12 inches of each stem till ample rundown was obtained. Weedone 2,4,5-T butoxy ethanol ester, was used in a 4% solution by volume in kerosene giving 16 pounds of active acid equivalent per 100 gallons of solution. The 1/40 acre plots were staked out; the original stems were counted and measured. During the spraying process a careful record was kept as to the time required and volume of solution used. In subsequent retallys the original stems and suckers were kept separate. Tabular results are found in Table 2 and figure 2.

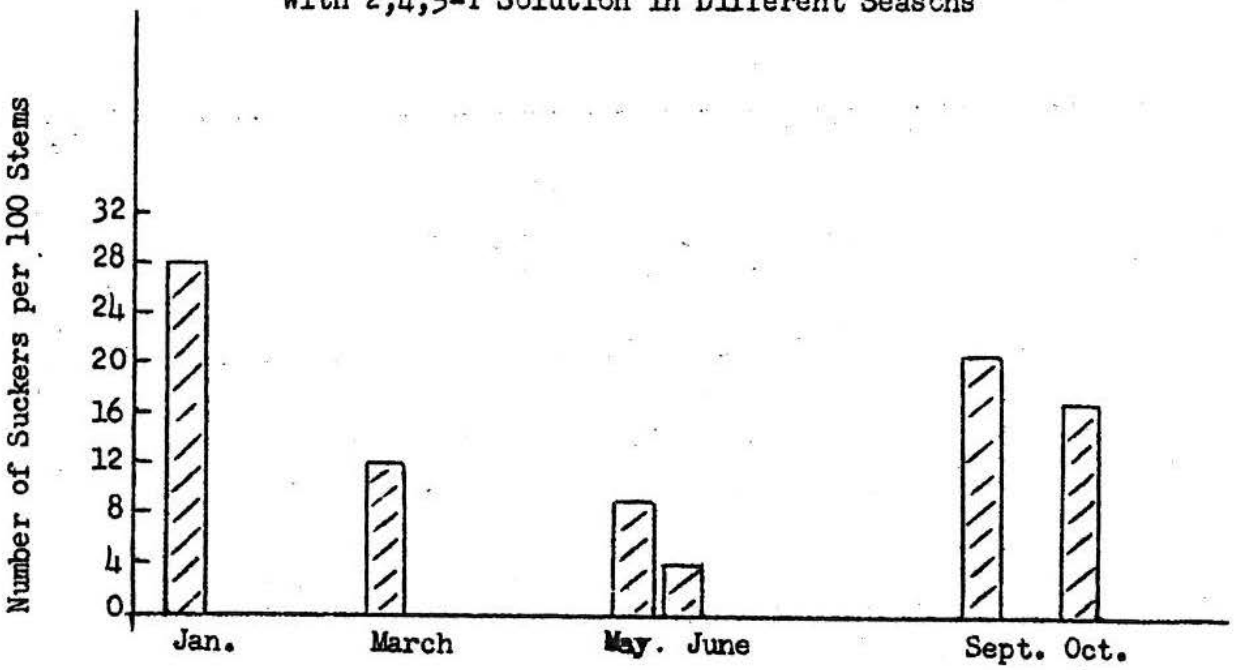
TABLE 2

Effect of Season of Basal Spraying on Root Suckering on Young Aspen

Date Sprayed	Soln. per stem oz.	Spray per Acre Gal.	Total orig. stems on 1/40 Acre	Dec. 1952 % orig. Stems killed	Retally 1952 Suckers No.	July 1953 % orig. Stems killed	Retally 1952 and 1953 Suckers No.
3/21/52	0.89	63.36	229	97.1	16	100	28
5/10/52	1.58	58.08	118	100.0	6	100	11
6/16/52	0.83	52.80	204	94.2	3	100	9
9/8/52	1.32	79.20	192	———	—	100	42
10/31/52	1.43	142.56	319	-----	—	99.7	55
1/8/52	1.70	155.76	294	-----	—	93.5	84
7/31/53	4.62	168.96	117	-----	—	-----	—

FIGURE 2

Number of Suckers Obtained per 100 Stems Treated with 2,4,5-T Solution in Different Seasons



The effects of the spray in different seasons on the first year suckering of aspen are distinct. Three to six times more suckers were found after dormant season spray than after sprays in the seasons of active growth. It remains to be seen if suckering can be entirely eliminated by a basal spray later in the growing season. From the evidence in the preliminary tests, we can conclude that suckers will continue to increase in the dormant plots; whether this will be the case with the growing season plots or not will require retallying for another year at least.

The response of white pine to release from aspen was marked. Before treatment the pine were 2 to 6 feet high growing at the average rate of 0.7 feet in height per year. The first season after release the height growth was 0.8 feet and the second season they grew at the average of 1.2 feet per year. Similar white pines not released grew 0.7 feet per year for the same periods. All seasons gave effective release of the pine so that for this purpose any season of application will yield effective results. Those pines on plots sprayed in May and June showed slight twisting in the current years growth pointing up the need for particularly careful spraying at that time to avoid serious effects from the spray.

EFFECT OF BASAL SPRAYS ON ROOTS

In order to determine the origin of suckers arising in the spray plots, root excavations were carried out in July and September, 1953. The first

plot examined was that sprayed on May 10, 1952. Of the 13 root suckers arising on the plot, 2 were from trees off the plot while 11 were from sprayed aspen on the plot with dead stems and tops. A second plot, sprayed on June 16, 1952, was excavated and of the 19 root suckers on the plot, 9 were from sprayed aspen with dead stems on the plot, 10 suckers were from trees off the plot.

These root excavations revealed some interesting facts regarding the effect of basal spraying on roots. First, above-ground portions, including the root collar area of aspen may be readily killed by basal sprays and not kill the roots which then proceed to produce root suckers. In these tests, portions of roots have been killed extending from the root collar as far as 4.3 feet, and these same roots have still produced suckers 7 feet farther out along the root. This killing of the stem and partial killing of the roots has occurred in all seasons under test, although most effective suppression of root suckering was obtained in the active growing season (Table 2).

DISCUSSION

Arend (1) finds that using a 3% (12 lb./100 gals.) solution of 2,4,5-T ester in diesel oil during full leaf development offers promise of controlling aspen without subsequent sprouting for at least three years. Morrow (3) in dealing with aspen and beech reports that none of the aspen receiving treatments (most of them were dormant treatments) sprouted. These two investigators worked with large aspen. Arend's treatments were apparently made on 4-5 inch basal diameter trees while Morrow's tree sizes ranged from 4-12 inches d.b.h.

Our results (obtained on 1-2 inch basal diameter aspen, 10-15 feet tall) parallel the conclusions drawn by Arend. The small aspen, respond better to the growing season treatments than to dormant treatments, though complete elimination of root suckering was not had.

The practical conclusion seems to be, where possible, to let aspen grow to at least 3-4 inches d.b.h. before treating. At maturity sprouting can be eliminated by treatment with 2,4,5-T in oil at any season; while at middle age suckering can be controlled by summer basal treatments; and if aspen must be treated while very young, summer basal treatment will yield the least root suckering.

SUMMARY OF RESULTS

A study of basal spraying of young aspen over-topping pine has been made over the past 4 years in central Pennsylvania. Basal spraying the bottom 12 inches of stems at any season of the year effected a release of 6 to 7 year-old pines planted under an aspen canopy. The most effective season to reduce root suckering of sprayed aspen proved to be the growing season (June-August). When winter basal spraying was used, it was necessary to repeat the spray in 3 consecutive years to get adequate control of root suckers. Extremely high concentration of 2,4,5-T up to 400 lb. per 100 gal. of solution was not as effective as 16-40 lb. per 100 gal. solutions. Finally, it was possible to

kill aspen tops in any season and still not kill the roots of all trees, so that a drastic 100% eradication by one spray does not seem likely to occur when young vigorous aspen are treated.

LITERATURE CITED

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